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ABSTRACT

One of the major issues currently facing the United States is the impact of the emerging high-technology economy. Some experts suggest that the economy will require great numbers of very highly educated persons to fill the new high-technology jobs. Others, such as researchers at the Bureau of Labor Statistics (BLS), predict that few highly trained people will actually be needed in a high-technology economy, because, while high-technology jobs will grow by high percentages, the actual numbers of new jobs will be small. The BLS instead expects the economy to require many more low-skilled jobs, such as clerks, waiters/waitresses, secretaries, and retail sales personnel, to work in an increasingly service-oriented economy. However, the BLS's predictions are based on the assumption that the future economy will be similar to the present one, a premise that may not hold true. For example, the BLS expects that many more retail sales persons will be needed, but an upsurge of catalog shopping, and possibly computer shopping, may well cut the number of sales persons needed. On the other hand, the emerging high-technology economy may change some formerly low-skilled jobs to jobs requiring a much higher level of knowledge and skills. For example, the job of secretary has been upgraded substantially by the addition of word processing equipment and computers to offices. With this equipment, fewer secretaries may be needed, but they will fill much more complicated jobs. Therefore, the work force of the future high-technology society may, indeed, need greater levels of education and higher-level skills, and the education establishment must prepare for this necessity. (KC)

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Working Paper No. 3

EDUCATION AND THE HIGH TECHNOLOGY ECONOMY

by
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Paper prepared at the National Forum
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One of the major issues currently facing the country is the impact of the emerging high technology economy. There are many unknown aspects of this emerging economy; and there are intense debates about these unknowns. One unknown is whether the U.S. economy, irrespective of its dependence on high technology, will grow in real terms, on a per capita basis, over the next 10 to 20 years. There are many who feel that economic growth, as this country experienced in the first three-fourths of the twentieth century, is no longer a reasonable probability; they suggest that the country should adjust to a steady state economy and develop public policies based on that reality.

Others suggest that economic growth is possible, and identify various policies that could stimulate growth. Even growth assumptions are not without major problems, however. One relates to employment. Under both growth and no-growth scenarios, some analysts suggest that the number of jobs will decrease, with a concomitant increase in the number of people unemployed. Others suggest that the strategies required for economic growth are also strategies that can match numbers of jobs with numbers of people seeking jobs, i.e., that the economy based on the microelectronic chip can produce economic growth and maintain high employment. Finally, and the issue to be discussed by the panel this morning, is whether the jobs that will be available -- whether many or few -- will require a higher or lower level of skills than today's jobs and whether the education system needs to be changed to produce those levels of skills.

These issues are neither analyzed nor resolved easily. Moreover, the different conclusions imply the development and implementation of very different public policies. If the spate of recent national reports on education, and the policy recommendations they propose, are to be taken as a resolution of these issues, it would seem that the country is headed for solid economic growth, that the emerging high technology economy will produce enough jobs to keep those in the labor market employed, but that the jobs in this new economy will require a higher level of skills on the part of every worker, in comparison to the job skills required today.

The problem with these claims for the economic future is that, for the most part, they have not been bolstered by analytic arguments. In the reports, they tend to be proclamations not conclusions drawn from analysis. By contrast, those arguing that the emerging economy will "deskill" the workforce have amassed much data, have produced plausible analyses, and have drawn what most would consider to be reasonable conclusions from their analyses. The analyses draw upon data provided by the U.S. Bureau of Labor Statistics related to projected job requirements. In a recent report, this neutral government body identified projected numbers of jobs in the economy for the next 10 to 20 years, under three overall growth assumptions. While the BLS projections show that, indeed, the increase in the "high tech" jobs is dramatic in percentage terms, they also show the

current number of high tech jobs is so low that when the high percentage increases are translated into numbers of jobs, the numbers are quite small. The bottom line, moreover, is that the job categories shown by the BLS that will account for the largest number of new jobs in the future are not high tech jobs, nor high skills jobs, but low tech, low skill and low salaried jobs such as:

- o Retail salesclerks
- o Managers and administrators
- o Cashiers
- o Secretaries
- o Waiters and waitresses
- o Cooks
- o Stockhandlers
- o Janitors
- o Bookkeepers
- o Miscellaneous clerical workers

In an article in the July, 1983 Atlantic Monthly, Robert Kuttner cites these results and concludes that an economy based on the capabilities of high technology will require only a small percentage of highly skilled people, a large percentage of low skilled people and virtually no middle-class. If such a view is correct, the proclamations of the recent national task forces on education can be dismissed, and the country should focus on issues such as use of leisure time, the role of a technological elite in a democracy, and economic growth coupled with rising unemployment.

However, while compelling at first blush, the arguments of those who claim the future economy will deskill the labor force are not convincing. They are not convincing for at least two reasons. First, they are based on assumptions (made by BLS) that the composition of the emerging economy will not differ substantially from the composition of today's economy. That is similar to projecting the job needs of the industrial economy based on the composition of the agricultural economy. Second, they are based on economic assumptions that at best would result in a growing economy and a growing unemployment rate, a situation antithetical to American values and objectives.

Why might the BLS scenario of the future be in error? For two reasons. First, as to the BLS projected increases in jobs for cashiers, retail clerks, and stockhandlers. Given current ways products are sold, and making certain assumptions about growth in the economy, the BLS projections would be accurate. What the BLS projections fail to recognize, however, are the radical changes already occurring in product sales in this country, and even more radical changes likely to occur in the future. For example, catalog sales are increasing at a large rate in this country. This is relatively recent happenstance. Each catalog sale decreases the need for retail clerks and cashiers. Moreover, the potentials of electronic shopping, which

easily can be implemented within the next decade, could rapidly accelerate this trend. As a result, large numbers of products now sold in stores could be sold electronically through home computers: the number of retail sales clerk positions thus could be eliminated if not reduced substantially, cashier jobs would drop, distribution centers could be decreased since the computer would enable sales to be made directly from the factory, and thus the number of stock handler jobs also would drop. Since the financial aspects of the transactions could be handled electronically also, check handler positions could drop, bank teller jobs could decrease, the number of accounting jobs could diminish and the number of billing clerks could drop. The point: many of the job categories identified as increasing in numbers in the BLS projections could virtually disappear, or at least diminish rapidly, because of structural changes in the way sales transactions could occur in the high tech, telecommunicated economy of the next decade.

The second issue concerns job categories now used by the BLS to indicate a low skilled job but which, in the future, could be used for a much more complicated and therefore higher skilled job.

The best example is the job of secretary. Two types of secretarial positions exist in this country: the first is a low skilled job, which is the job the BLS predicts to rise in numbers. The second is a much higher skilled job, a new type of job created by telecommunications and computer related capabilities, and for the most part overlooked by the BLS. The first one is the standard conception of a secretarial job: a relatively low skilled job, with a workload that is not particularly heavy, created to serve usually one person, and including such tasks as routine filing, clerking and typing. This is a dying job category. While this general outline describes the majority of secretarial positions at ECS 10 years ago, for example, none of that type of secretarial positions exists today. That job has been replaced by a new version of the secretary: a highly skilled person, who works for two, three and four people, on a word processor (which is connected, at ECS, to the organization's central computer), who often is asked to take the results of data analysis and incorporate them into textual materials, who increasingly is communicating with staff through a network of computers connected via a series of telecommunications mechanisms, and who (through recently installed computer connections with typographical machinery) now can take word processed material and have it typeset, run off on letter quality printers, or communicated across the country via electronic mail. This is not the secretarial position envisioned in the BLS projections; a person in this position is not fi' ng an unskilled position. While the chip has automated many of the functions of the old job, the new job has increased in complexity many fold, and now the jobs of typist, research assistant, administrative assistant, typesetter, design and layout, to name a few, are done by what is called a secretary. In short, the

secretary of the future, while perhaps accounting for an increasing number of jobs, will represent a very different type of job, and a job that will require a higher level of skills than the secretary today.

Many other examples could be given showing inherent fallacies in the BLS projections of the jobs of the future. All would suggest that depending on the BLS data is precarious and will likely lead to erroneous conclusions. What, then, will the economy of the future look like, what kinds of jobs will exist and will they be high or low skilled jobs?

To briefly outline the argument leading to an alternative future, some realities need to be faced. First, the U.S. no longer has access to cheap raw materials and cheap labor. Thus, it is increasingly unable to tap the economies of large scale productions to produce products at lower prices than can be produced by other countries. Other countries not only have access to the production technology of this country, but also often have cheaper raw materials (such as energy) and much lower wage rates. This means that it is more difficult for this country to compete in global markets in the large scale production of standardized products. Other countries can do it cheaper, and at the same -- if not higher -- level of quality. Automobile production is just one example. Cold rolled steel is another. Glass is a third. Textiles and apparel are a fourth example. An Atari games are a fifth!

The alternative of engaging in highly automated production, where robots replace the worker and technology is imbedded in the equipment, has the shortcoming of not producing jobs. While such a strategy could increase the country's overall level of wealth, and thus provide economic growth, it would do so while simultaneously increasing the numbers of those without jobs, a deleterious social side effect.

Recent experience in Puerto Rico shows the shortcomings of both of the above strategies. As a recent long article in Business Week (October 3, 1983) outlined, Puerto Rico adopted an economic growth strategy that combined its obvious tax advantage and low wage rate (relative to the U.S.) to lure corporations engaged in large scale manufacturing, especially apparel and textiles. For a time the strategy worked, the economy grew and unemployment dropped. Then the corporations discovered that other Carribean countries had even cheaper labor and moved their plants to those countries. Puerto Rico also lured some capital intensive industries, such as pharmaceuticals and manufacturing. But these companies were so highly automated that, while contributing to the growth of the economy, they provided few jobs. The result today is that the economy is growing, but the employment rate is also growing and causing increasing social unrest.

So, if the future is not in mass production of standard items, nor in automated production, nor in the high tech component of the economy because, while growing, it simply will not produce many new jobs, what is the successful strategy for the future? Put differently, what is a strategy that increases the wealth of the economy and produces the numbers of jobs needed by those entering and remaining in the labor force over the next 10 to 20 years?

The answer is in economic activities in which the "value-added" to goods and services by workers in the U.S. economy is greater than the value-added by workers in other countries, and in activities that take a highly skilled laborer to conduct. The former would target customized and speciality products, i.e., products and services that represent the state of the art. One example is computer software, a labor intensive activity that provides products that are cheap to reproduce but which command very high prices in the market. Another target would be specially designed, short production run items such as microelectronic chips that are produced both through computerized assisted design and computerized assisted manufacturing. Other examples would include the machines that other countries could purchase for the efficient production of standardized products. Additional examples include specialty steel, specialty glass, and customized office furniture.

Puerto Rico again serves as an example. To replace the textile and apparel manufacturing lost to lower wage rate countries, Puerto Rico is recruiting a series of computer manufacturing companies. These companies are interested in locating in Puerto Rico to take advantage of the available tax breaks, but also because it is one of few countries that has a work force with a high enough level of skills to engage in the tasks required for computer manufacturing. It is the skill level of its work force which sets Puerto Rico apart from many of its neighboring countries.

This conclusion is true for this country, too. If the best economic growth strategy is to be on the cutting edge, as it were, to work in the specialty niches of most markets, to provide more value added by our labor force, it can only succeed with a highly skilled labor force. Or put differently, the strategy for maintaining both economic growth and high levels of employment hinges on developing the human capital in our economic system, not to the exclusion of physical capital, but to a degree that makes our labor able to perform more complicated and more highly valued tasks. Thus, instead of deskilling the work force of the future, the successful economic strategy for this country is to rely on a higher level of skills in the work force.

The implication for education is obvious. The traditional focus on imparting basic skills and knowledge, content on a one time basis and established rules and procedures that change little over time, will need to give way to an

education focused on imparting the higher level, learning-to-learn skills, and the ability to learn and relearn new content continually as knowledge half-like shrinks.

The high technology future is not fixed. The existence of the microelectronic chip and of biogenetic engineering is a reality, and is and will continue to transform the economy. For this country, decisions need to be made about how to use the powers of those new technologies. If the decision is to use them to increase the capabilities of physical capital, to put the intelligence in the machines, the future economy will be a deskilled economy. I would predict it also will not be a growing economy. If the decision is to use the powers of the new technologies to enhance the capabilities of human resources, to exploit the potentials of the new technologies to their fullest, the future economy will require higher not lower skilled workers, and it also more likely will be a growing economy.